

AMENDMENTS TO THE CLAIMS

1. (original) A method of extraction of phytosterols, squalene and vitamin E from crude palm oil comprising the steps of:-
  - a) conversion of crude palm oil into palm oil methyl esters;
  - b) three short path distillation of crude palm oil methyl esters obtained in 1 (a) to yield phytonutrients
  - c) saponification of phytonutrients concentrate from 1(b);
  - d) crystallization of phytosterols;
  - e) solvents partitioning of vitamin E and squalene.
2. (original) A method of extracting phytosterols squalene or Vitamin E as claimed in Claim 1, wherein a first short path distillation is carried out at temperature of 70°C to 120°C and pressure between 10mTorr to 50mTorr.
3. (currently amended) A method of extracting phytosterols squalene and Vitamin E from crude palm oil comprising the steps of:-
  - a) conversion of crude palm oil into palm oil methyl esters;
  - b) three short path distillation of crude palm oil methyl esters obtained in 1 (a) to yield phytonutrients
  - c) saponification of phytonutrients concentrate from 1(b);
  - d) crystallization of phytosterols;
  - e) solvents partitioning of vitamin E and squalene as claimed  
in Claim 1, wherein a second short path distillation is carried out on the distillate obtained in Claim 2 at temperature of 130°C to 200°C and pressure less than 1mTorr.
4. (currently amended) A method of extracting phytosterols squalene and Vitamin E from crude palm oil comprising the steps of:-
  - a) conversion of crude palm oil into palm oil methyl esters;
  - b) three short path distillation of crude palm oil methyl esters obtained in 1 (a) to yield phytonutrients

- c) saponification of phytonutrients concentrate from 1(b);  
d) crystallization of phytosterols;  
e) solvents partitioning of vitamin E and squalene as claimed in  
Claim 1 wherein a third short path distillation is carried out on the distillate obtained in Claim 3 at temperature below 120°C and pressure less than 1mTorr.
5. (original) A method as claimed in Claim 1, wherein the saponification process of phytonutrients concentrate is carried out using potassium hydroxide or sodium hydroxide at 10% concentration and refluxed in alcohol for 30 minutes to one hour under inert gas blanketing.
6. (original) A method as claimed in Claim 5, wherein the inert gas is nitrogen.
7. (original) A method as claimed in Claim 5, wherein unsaponifiable matters is mixed with hydrocarbon solvent, short chain alcohol and water of different ratios.
8. (original) A method as claimed in Claim 5, wherein the unsaponifiable matters is mixed with hydrocarbon solvent, short chain alcohol and water of ration 25:1:1 and heated to temperature of 65°C to 85°C and slowly cooled to temperature of 10°C to 30°C to crystallize phytosterols.
9. (original) A method as claimed in Claim 8 wherein the filtrate is mixed with hydrocarbon solvent and short chain alcohol of ratio 5:3 to partition the non-polar squalene into hydrocarbon layer and polar vitamin E into alcohol layer.
10. (original) A method as claimed in Claims 5, 7, 8 ~~or~~ and 9, wherein the hydrocarbon solvents including heptane, hexane and iso-octane and short chain alcohols including methanol, ethanol, butanol and iso-propanol.

11. (currently amended) Vitamin E, squalene or phytosterols as extracted as in claim 1 ~~any of the Claims 1 to 10~~.

12. (original) A method of extraction of phytosterols, squalene and vitamin E from crude palm oil comprising the steps of:-

- i. conversion of crude palm oil into palm oil methyl esters;
- ii. first stage short path distillation carried out on the methyl esters obtained in step (i) above at a temperature of 70°C to 120°C and pressure between 10mTorr to 50mTorr;
- iii. second stage short path distillation carried out on the distillation obtained in step (ii) above at a temperature of 130°C to 200° and pressure less than 1mTorr;
- iv. third stage short path distillation carried out on the distillate obtained in step (iii) above at a temperature below 120°C and pressure less than 1mTorr;
- v. saponification of the distillation obtained in step (iv) above carried out using potassium hydroxide or sodium hydroxide at 10% concentration and refluxed in alcohol for 30 minutes to one hour under nitrogen blanketing;
- vi. mixing the unsaponifiable matters in step (v) above with hydrocarbon solvent, short chain alcohol and water of ratio 25:1:1 and heating mixture to temperature of 65°C to 85°C and cooling slowly to temperature of 25°C to 30°C to crystallize phytosterols;
- vii. mixing filtrate obtained in step (vi) above with a hydrocarbon selected from the group consisting of heptane, hexane or iso-octane and a short chain alcohol selected from the group consisting of methanol, ethanol, butanol or isopropanol in ratio 5:3 to partition non-polar squalene into hydrocarbon layer and polar vitamin E into alcohol layer;
- viii. separating two layers and subsequently adding

hydrocarbon selected in step (viii) into short chain alcohol layer selected in step (viii) and short chain alcohol selected in step (viii) into hydrocarbon layer to further partition the vitamin E and squalene;

- ix. extracting squalene from the hydrocarbon layer and extracting vitamin E from the alcohol layer.

13. Phytosterol crystals as obtained in Claim 8.